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Hints on the Working of a

Laboratory Printing Machine

By T. C. HUTCHINS

THE laboratory printing machine is undoubtedly one of the most important pieces of equipment in any print-works for several reasons:

1. The great amount of time and material saved by sampling in the "lab" instead of in the print shop.
2. The fact that it is available at any time.
3. Equally good results can be obtained by means of its use for sampling purposes as compared with the large machines.

There are three main purposes for which a lab machine is used:

1. Testing of all print dyestuffs on delivery.
2. Sampling out of new shades of all kinds as these are submitted for matching.
3. Experimental work on new coloring matters, thickenings, chemicals, etc.

It is often necessary to sample out new ranges of coloring matters and when this is being done, the sample printing machine affords the cheapest and speediest method of getting through a lot of work in a very short space of time. Once the recipes have been worked out, the thickenings, chemical solutions, etc., prepared, the making up of the actual colors is only a matter of routine and with an experienced hand the samples can be run off as quickly or more quickly than they can be got ready. In such a case the speediest method is to prepare a lot of samples first of all (say 20) and run the lot off at a session.

The hints given in this article are of the type that will ensure clean, well printed samples if the precautions outlined are given heed to.

Some laboratory printing machines have no attachment on the back whereby a small batch of cloth can be batched up neatly and tightly, so as to feed into the printing machine in a regular manner. In a machine of this kind the only way in which the cloth can be fed in is by hand in small pieces at a time. It is not possible always by this means to ensure the production of a level print, free from creases, etc., and the method outlined as follows is very much better.

In order to prepare the batched up material the first consideration is the width of the cloth. Eight inches is a good width and a piece of material measuring 48 inches can be split up into six equal portions. Say, for instance, that we take a yard of 48-inch material, thus split up in such a manner it would provide 6 yards of 8-inch material. The pieces are all sewed together and all loose threads removed from the sides. Next the batch of cloth is left down at the back of the printing machine and the end led through guiding bars and on to a small beaming slip at the back of the machine. This beaming slip is often supplied without a handle but it is an easy matter to fit a small handle and by this means wind on the cloth (through the tension rails) in a taut and even manner.

It is important to ensure the evenness and firmness of the batch and for this reason it is a good plan to stick the inside end of the material to the wooden slip by means of a small amount of gum, etc. If the threads are not removed from the sides as previously directed, the danger is that these will go through along with the cloth and spoil one or more samples until they are removed. The spoiling of a sample is not in itself a great matter, but it often entails a good deal of extra work in getting another printing color ready, if all the first one has been used in producing an inferior result. Another point to bear in mind just here, is never to throw the printing mixtures out, 'till the sample prints have been developed. The writer calls to mind more than once having to make up fresh lots in such cases when a mishap occurred in the steaming or developing of the prints and fresh print colors had to be made up to meet the emergency.

The length of material to print is a matter depending entirely upon the use to which the sample prints are to be put. If it is a matter merely of matching a shade then two turns of the roller or even one in many instances may be sufficient. If on the other hand the samples are for

show purpose (to display a range of colors to a prospective customer) several turns of the roller will be necessary to give a good expanse of color. For matching purposes the small prints are quite sufficient and are indeed easier to work with, for the reason that several prints can be steamed, developed, etc., together, so saving time.

In order to print a sample the first thing to do is to thread the material into the printing machine. This is done by passing the cloth between the nip, i.e., between the bowl of the printing machine and the engraved roller, and pasting it or pinning it on to the back-grey. The latter method is speedier and safer. For instance, it will sometimes happen that a pasted end will part from the grey and fall down on to the color and spoil several samples, whereas when it is pinned, such a mishap cannot take place. Next, the doctor cleaner blade is adjusted at the back of the roller and the edge kept in close contact with the roller by means of a screw, which itself can be adjusted by screwing up or down on to the bed plate of the machine. The front or box blade is then inserted. It is known as a box blade in consequence of the fact that as well as acting as a kind of doctor it is made in such a way as to form a receptacle for the color to be printed. This done, the print color is poured into the receptacle formed by the angle of incidence made by the edge of the box blade and the surface of the roller, and the handle of the machine given a few quick turns so as to furnish the printing roller with color. It is important to remember never to begin to print until the roller has been thoroughly furnished with print color. Next, the bowl of the printing machine is screwed down by means of a handle provided at the side, until a suitable pressure is exerted, and one or two turns of the printing roller handle made evenly, when the print should come through perfectly clean and level. It is important also not to have too great an amount of pressure on the bowl, otherwise the print will probably spew, or alternatively, have a bare and ill-furnished appearance, in consequence of the fact that the color is being forced out of the engraving. When the print has come through, the bowl should immediately be lifted away from the roller and the back-grey pulled taut so as to lift the cloth clear of the printing roller. If this is not done, then there is a danger of the cloth getting splashed with water and color during the washing of the roller.

The doctor blades are next removed and washed and dried. The speediest way to accomplish this is to hold each blade in turn under a swift flowing water tap, when all surplus color is speedily washed away and it becomes an easy matter to wipe the blade clean and dry. If the blades are merely wiped with a bundle of rags then the risk is run of their not being properly cleaned as the run of samples proceeds, by reason of the amount of color accumulating on the rags used for wiping.

The roller is next washed with a soft-haired brush with plenty of water and wiped dry before proceeding to print the next sample. A man accustomed to the work can accomplish all the foregoing movements in a very short space of time where a water tap is convenient. In fact, it is possible to arrange a small machine in such a way that one man can do all the printing himself.

It is a good plan also to have two printing rollers which are, of course, interchangeable. One will have on it a blotch pattern or merely a series of heavy running stripes, while the other will be in the form of a smaller pattern made up of small objects, dots, various thicknesses of lines, etc. The blotch roller can be used for direct prints, etc., and the finer roller for discharge work, dark print colors, and for printing very fine materials, etc.

One of the problems in using such a machine for the running of a large number of samples of different kinds, is the marking of each sample as it is printed. The simplest way to do this is to obtain a small artist's brush and brush the number on in its own color.

Another even handier method is to use a small "piece end" marking pencil which gives an indelible mark by means of its patented writing point and self-containing writing fluid receptacle.

The back-greys must also be clean and free from knots. A batch of greys is wound on in the same manner as the cloth. The slip is then lifted back and suspended by means of two hooks from the rear framework of the machine, which supports the guide rails, etc. The grey is then led over rails and into the machine in exactly the same manner as in a large machine. When printing, the impression is made on the cloth backed by the grey with a piece of washer blanket (in endless form) for a foundation on top of the usual woolen lapping round the bowl.

Cloth and grey pass over the machine together and when sufficiently dry to prevent marking off, the cloth is removed and hung up to dry in a warm place or dried by hand in the stenter house if possible.

It is sometimes necessary when printing a series of samples, to print the same color on white and dyed grounds. For instance, it might sometimes be necessary to print a vat color on white and dyed grounds to show a direct print and a discharge print of the same color. It may even be necessary to produce a series of such prints. If so, this can be managed quite easily by sewing the pieces of dyed and white ground cloth alternatively and batching up the lot in the manner already described. Each print color can then be produced on a piece of white and a corresponding piece of dyed material in one operation.

A very necessary piece of equipment, if the machine is to be kept clean and tidy, is a small wooden trough to fit in below the printing roller so as to catch the remainder of the print color when the blades are removed. At the end of a run of prints this trough can be lifted out, emptied, rinsed and replaced with a minimum of trouble. The machine is always placed on a suitable wooden stand and it is also a good plan to have the stand grooved so that all washings, etc., are conducted through a hole and down a small drain pipe leading into a receptacle for waste. Such a waste bucket is easily provided in the form of an empty dyestuff drum.

Washington News Letter

By **WALDON FAWCETT**

OBSERVERS at Washington have shifted to late June, or even late July, as the date of their guess on the adjournment of the present session of Congress. The number of major issues yet to be disposed of presupposes continuation well into the summer if the "must" program of the Administration is to be fully covered. And even that schedule makes no allowance for the possibility of new injections. As, for example, legislation designed to cope with developments in the textile industry growing out of the import situation, particularly the Japanese competition.

THE CONTROVERSY OVER ARTIFICIAL FOOD COLORS

News that the Copeland Bill is likely to remain on the shelf throughout the remainder of this Congressional session may be received with satisfaction by those members of the dyestuffs industry who realized how complex a snarl has been precipitated over the color clauses of the Food and Drug Revision Bill. Supported by the Administration in basic principle, the measure to modernize and consolidate the food statutes was, by the broad terms of President Roosevelt's message, left open for reconciliation, within Congress, of the divergent ideas on details. The consequence, as might have been expected, was to produce the semblance of a deadlock.

The pulling and hauling over color regulation is the more of a surprise because, when the initial draft of what came to be known as the Tugwell Bill was put forward it contained only a promise of aid and nothing of hazard for the color industries. A minor gesture in behalf of 100 per cent enforcement was the extent of the revision in the color section. Assurance was given officially that the proposed statute would impose upon manufacturers, packagers and users of colors no greater restrictions than the present certification regulations. By way of benefit the commercial interests were to be relieved of a degree of unfair competition in the sale of uncertified colors. This latter traffic it has not been possible to control under existing law, because prosecution was impracticable unless it could be proven that indicated colors or their impurities were present in such quantities as to be injurious to health.

No serious objection has been offered to this plan to tighten the dye censorship, but belated protests at other angles have created a controversial atmosphere. Particularly has resentment flared over the provision in the later editions of the Copeland Bill which would require a statement confessing artificial color content on the label of every food product which contains a dye. The National Confectioners Association and other bodies representing large users of food colors are up in arms against this exaction which goes beyond the requirement of the present law.

Protestants are pointing out to members of Congress that there is no need for the contemplated color notation inasmuch as deception or the coloring of inferior food products is already fully covered under the Federal Food Act. Furthermore, all colors in use are, by the operation of the Certification system, guaranteed harmless. The proposed demand would work a material hardship in that it would necessitate the reprinting of labels, containers, etc. More serious in the prospect is the sentimental hardship which would ensue if, in popular translation, a vague stigma was placed upon dye-colored syrups and other products which have no color of their own, nor, indeed, no flavor beyond the sweet taste.

To further becloud the issue, representations have been made at Washington by the interests,—notably the H. J. Heinz Co. of Pittsburgh, Pa.—which favor prohibition of the use of any artificial coloring in ordinary food products. Exception would be made only in the case of delicacies and desserts which are naturally colorless. There is scant chance that the anti-dye lobby can convert Congress but the agitation has contributed to the cross currents and confusion.

TVA ASKED TO SPONSOR HAND-WOVEN TEXTILES

The latest move to secure greater distribution for hand-loomed textiles produced in the Appalachians appears as part of the New Deal. The U. S. Department of Labor has transmitted to the Tennessee Valley Authority a report prepared by the Women's Bureau on the handicraft activities of the inhabitants of the Southern mountain regions. Embodied in this report is a recommendation that the TVA take active steps to develop and expand the markets for this class of products—the most valuable portion of which is represented by the hand-woven woolens and subsidiary specialties.

That the proposal is not based wholly upon assumption and theory is attested by the fact that the Federal investigative organization, in cooperation with the National Retail Dry Goods Association, arranged meetings with leading merchants in a number of the larger cities at which promises were made of cooperation in promoting American handicraft lines if quality standards can be raised and maintained and if there be developed responsiveness to prevailing trends in color and design.

Specifically, what the Department of Labor seeks at the hands of the Tennessee Valley Authority (or, the TVA in cooperation with the National Park Service of the U. S. Department of the Interior) is the establishment of a new agency to supervise and promote orderly production and

intensive marketing. A non-stock, mutual benefit association is indicated. The ultimate program would embrace the establishment and operation of production centers, the inauguration of a centralized designing service and the organization of a merchandising intelligence service to forecast the shifts of style and color. Cooperative purchasing of dyes and other supplies would be undertaken. Finally, the concerted effort to uncover new outlets and otherwise improve marketing conditions. The plan would be financed by a loan of $100,000 by the Government, repayment to begin after three years, the project thus ranking as self-liquidating.

FEDERAL DETACHMENT ON COLOR NOMENCLATURE

Comment in the AMERICAN DYESTUFF REPORTER, issue of May 6, on the lack of uniformity in dyestuff designations brings to mind the reluctance which official Washington has always displayed to enter into any plan for standardization of the color vocabulary. The Commercial Standards group, and more specifically the Division of Simplified Practice, at the National Bureau of Standards, is logically the point of contact for inter-industrial or intra-industrial movements seeking the support of the Government for standardization of color terms. But here, as elsewhere in the official directorate, there is no response to the oft-repeated suggestion that the Government take the initiative in compilation of an authoritative color dictionary. Onlooking officials feel that when a single industry is guilty of perpetrating as high as 1,500 separately named colors it is high time that a halt be called. But they hold that the initiative must remain with industry. In this conservatism they have the justification of certain memorable experiences. As a case in point there was the episode of the attempt at reform in the color nomenclature of the paint industry. Some years ago certain leaders became convinced that the excess of color designations was working hardship in the paint industry and asked Federal aid to scale down the range. In the appeal it was stated that ten color designations would suffice where hundreds were in use, to the confusion of color users. In furtherance of the crusade a conference was arranged under the auspices of the Commerce Department. But it was found impossible to reconcile the ideas of the representatives of the industry and the project was dropped. In isolated instances, the Department has acted as go-between in bringing about a standard color designation, such as "School Furniture Brown." But there is no ambition to further a comprehensive color vocabulary. A final repressant influence grew out of the difficulties of the project to standardize the colors of the United States flag. Complications multiplied when it was discovered that tentatively accepted blue and red dyes were susceptible of variation when translated to wool, cotton and silk, respectively.

PATENT BILLS TO COMPEL MANUFACTURE

Though the present session of Congress has been accounted an unfavorable time to seek to force passage of the long-pending programs of Patent and Trade Mark Revision, the would-be regulators of patent privilege have been busy. As is attested by several bills in both houses. One of these exponents of reform-via-patent-restriction is the Sirovich Bill (H. R. 4986) which would limit the life of a patent to a term commencing with the date of the application. The full intent is, of course, to compel the working promptly of all patents. That is to say, to penalize any delay in placing a new invention on the market. Under the bill, the Commissioner of Patents, or any court having jurisdiction, may allow an extension of time, not to exceed two years, to compensate for delays during pendency of the application not caused by the applicant.

Akin in objective is the King Bill (S. 383) to provide compulsory licenses for unused patents. Under the terms of this bill, any person may, after the expiration of five years from the date of issuance of a patent, file an application for compulsory license. The application must show that for a continuous period of one year prior to the date of application no use or insufficient use has been made of the patent by the patentee or any authorized person. The would-be grantee must make an offer for a license,—stating the specific terms, conditions and royalties which he will give. If the Commissioner determines that the public interest will be served, he may, after a public hearing, duly grant a license imposing a minimum manufacturing requirement and stipulating terms and conditions —which latter are subject to alteration upon the showing of any interested party. By the bill the Commissioner would also have authority to revoke a patent if the patentee refuses to grant a license.

A third bill in the reform category is H. R. 4523 which provides for the recording with the Commissioner of Patents of patent pooling agreements and contracts,—whether accomplished by assignment license, or otherwise. Copies of the agreements on file would become available to Governmental agencies called upon to consider complaints against the pooling of patents. Pooling agreements in effect prior to passage of the Act would have to be recorded at the Patent Office within six months. Civil penalties are authorized for any person, organization or association that violates or fails to comply with the summons to reveal compacts for common ownership, control or enjoyment of pooled patents.

TEXTILE DESIGN REGISTRATION—A LONG CHANCE

Only a combination of exceptional pressure from the industry, and rare luck in winning "unanimous consent," can be expected to win favorable attention in both houses of the present Congress for the measure to establish a Federal registration system for textile designs. The pending bill is known officially as H. R. 5859 and would take effect thirty days after enactment, insuring quick consummation if the legislature will give its approval.

In a general way the present edition follows the form

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PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

JULY 1, 1935

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Members should notify the **Secretary** immediately of all address changes

STANDARD SILK SAMPLES

There have been prepared, under the direction of the Sub-Committee on Fastness to Dyed Silk, standard dyed silk fabrics to represent four classes of fastness to washing—namely, Class I, Class II, Class III and Class IV. These standards have been carefully dyed with the dyestuffs and according to the dyeing methods recommended in the 1931 Year Book.

The A.A.T.C.C. is prepared to furnish sets of these washing standards for a nominal charge which will cover the cost of preparation. It will be possible to accurately grade the fastness by comparing it with the standards after subjection to the standard washing tests approved by this Association. All inquiries concerning these Silk Washing Standards may be addressed to the Chairman of the Research Committee—Louis A. Olney, Lowell Textile Institute, Lowell, Massachusetts.

Analytical Methods for a Textile Laboratory

The Council of the A.A.T.C.C., believing that Dr. Scott's series of articles entitled "Analytical Methods for a Textile Laboratory" might well be brought together in book form, have proceeded with its publication. Copies may be obtained from the Secretary of the Association, Harold C. Chapin, Lowell Textile Institute, Lowell, Mass., for 75 cents.

Proceedings of the American Association of Textile Chemists and Colorists

Vat Dyeing

in Package Machines*

By E. P. DAVIDSON†

WHEN the complication of manufacture and application of the vat dyestuffs is taken into consideration, their development has been accomplished with surprising rapidity. Certain natural vat dyestuffs have been known and used for as many years as we have knowledge of the ways of mankind, indigo being the outstanding example, but the synthetic dyestuffs to which we refer when we speak of vat colors today have been discovered, developed and come into common use within a period of thirty-five years. In this country their widespread application dates only from shortly before the world war. In these intervening years, the efforts of the dyestuff manufacturers and of the colorists experimenting in the dyehouse have combined to bring about improvement in the products themselves and in the methods of their application, which offers to our use today colors comparatively simple to manipulate, of a general fastness unapproached by the other classes of dyestuffs on cotton and related fibers, and in a practically complete range of shades.

The vat colors can be applied on any type of dyeing machine, but this discussion is confined to machines of the package-type. It is of interest to note that the package machine and the vat dyestuffs were being developed during the same period of time, and there has been a very considerable influence of each upon the other. The necessity for soluble dyestuffs for use in the short volumes of the circulating machine led to effort to improve the solubility of vat colors, while a number of the refinements of the package machine are the direct result of the desire to dye vat colors in it.

The two essential difficulties in dyeing on the package-type machine lie, first, in the shortness of the volume of the dye liquor and, second, in the fact that the whole system forms a very efficient filter through which the dye liquor is circulated over and over again. Both of these conditions necessitate very soluble dyestuffs which will dissolve completely without residue, and also prohibit the use of any dyeing or chemical assistants which are not completely soluble. If these conditions are not met, dyeings may result which are smutty, dull, uneven, or otherwise unsatisfactory. It is a characteristic of the package machine that foreign matter of any kind deposited on the package of yarn is impossible of removal. A certain proportion of such matter can be removed by means of a running wash, but unfortunately for the dyer, the majority of package machines are not so equipped that this can be done, and it therefore becomes in most cases impossible to even partially correct damage of this kind. It is the responsibility of the dyer to exercise due care that no insoluble matter is added to the machine and that no precipitation takes place.

The dyeing of yarn in package form really begins in the winding room. Unless this department delivers to the dyehouse packages uniformly-wound, neither too hard nor too soft, with special emphasis on the uniformity of each batch with regards to firmness, no dyer can turn out acceptable work, since one soft package on the spindle of a machine will usually cause a variation in shade in every package on that particular spindle. The exceptionally hard package is probably the lesser evil of the two, since it seldom ruins anything but itself.

While maintaining that dyeing equipment in good mechanical condition is important in all dyeing, it is especially so in package vat dyeing. A leaky packing gland in the pump can very easily throw a vat out of solution, or if it does not go completely out it may give rise to puzzling variations in shade from batch to batch for which there is no apparent reason. The stuffing boxes on the pump should be inspected regularly, the grade of packing recommended by the manufacturer should always be used, and worn or cut shafts should immediately be replaced. A number of cases have come to our attention where ground-up packing or lubricants working back into the circulating system had soiled the yarn and completely ruined the shade. Since many vat colors dye at a low temperature, a close control is definitely important. Care should be taken to see that the pump is of proper design, as certain types will through violent churning heat the water in the system so rapidly as to make it impossible to hold a temperature. Leaky steam valves naturally have the same effect. Overflow pipes should be adjusted so

*Presented at meeting, South Central Section, Jan. 26, 1935.
†E. I. du Pont de Nemours & Co., Inc.

that they do not splash badly or agitate the liquor in the expansion tank, since undue agitation may lead to rapid consumption of sodium hydrosulfite and may possibly throw the vat out of solution. Pumps should be checked to see that they deliver sufficient circulation under the appropriate operating pressure. The gauge pressure is not always a good guide to the amount of circulation taking place, since it is a peculiarity of the centrifugal pump that it will build up a high pressure with practically no circulation; on the other hand, the greatest circulation takes place when the pump is showing the least pressure. The pump should be balanced so that at the working pressure desired it will deliver sufficient circulation to pass the entire volume of dye liquor through the yarn at least once a minute. Pressures ranging from 15 to 30 lbs. are amply sufficient.

Soft water is more essential in vat dyeing than in the dyeing of any other class of dyestuff. While good results can be, and are, obtained with water of a fair degree of hardness, better work can always be turned out at lower cost where a good supply of soft water is available. If the natural water is at all hard, a water softening system is almost essential for any dyehouse which attempts vat color dyeing on package machines. As a general rule, 15 parts per million of hardness, calculated as calcium oxide, begins to give trouble with vat colors, and 25 parts per million is about the maximum which it is possible to use with any great degree of success. Hardness gives trouble in the dyebath, since a great many of the leuco compounds of the vat colors are quite sensitive to calcium and magnesium salts, and it also gives trouble in the soaping after dyeing, because of the formation of lime soaps which are almost impossible to remove when they are once deposited on the package. The use of the alcohol sulfates will minimize this condition in the soaping bath, even if it does not eliminate it entirely, but so far as we know there is nothing which will overcome the action of the salts in hard water on the dyebath itself. Several of the leuco compounds of vat colors, notably those of the chlorine-fast blues, are highly sensitive also to aluminum salts; therefore, where water supplies are drawn from streams and clarified by the alum-soda ash process, the alum content of the water should be watched closely to make sure that no appreciable amount of alum is left.

The proper preparation of the yarn before dyeing is no less important with the vat dyestuffs than with the other classes of colors, and in fact, it is probably of greater importance. Undoubtedly a great deal of time is saved and greater production can be obtained by the use of various agents which will wet the yarn thoroughly at low temperatures, making it unnecessary to drain the wetting bath in order to cool down before dyeing. There are, however, objections to this method. Impurities of various kinds are only partially removed, and those that are removed remain in the dyebath, making it difficult to obtain the maximum of brilliancy which is often of importance. Moreover, there are indications that the fastness of a dyeing made in this way is not as good as might be, and unless an exceedingly efficient wetting agent is selected, unlevel dyeing can easily result. As a general rule, probably the best preparation is a 20-30 minute boil, using some good boil-out preparation and a mild alkali such as soda ash; the machine is then drained and refilled with cold water, to cool down to the springing temperature. This procedure will remove a large proportion of the natural waxes and impurities in the cotton, leaving a better and cleaner bottom for the dyeing, and in addition most of the foreign matter is thus drained out of the system before the dyeing begins. In evaluating a product for use in the boil-out, it should be borne in mind that wetting efficiency does not necessarily mean boil-out efficiency. In other words, a product which shows high wetting efficiency when tested by the sinking method, is not necessarily a good compound for boiling out. A compound which shows a high efficiency in the sink test may be a good boil-out agent and again it may not, and there is no test which will finally determine the efficiency of a boil-out except an actual run in the machine. The vat dyestuffs are of course insoluble in water, but the leuco compounds formed by reducing the dyestuffs with sodium hydrosulfite are soluble in a caustic soda solution. The reduction of a vat dyestuff thus is simply a question of bringing the dyestuff into contact with a strong reducing agent, in the presence of an aqueous solution of caustic soda.

Most vat dyestuffs are sold in both paste and powder form. When using a dyestuff in the paste form, since the dyestuff is already dispersed in water, it is only necessary to dilute the paste with water to the reduction volume, and the caustic soda and sodium hydrosulfite can then be added. The pasting of dry dyestuff is a most important part of the reduction process. If all of the dyestuff weighed into the vessel is not thoroughly dispersed, complete reduction may not take place; in compound shades, if one of the components is more difficult to paste up than the other, rather baffling shade variations may occur from batch to batch. Dyestuff powders carry a wetting and dispersing agent designed to make them wet out quickly and easily and to disperse rapidly in water, but, even so, it is somewhat more difficult to disperse the present powders in water than it is to disperse a dyestuff in paste form. The powdered dyestuff should first be thoroughly pasted with very hot water, and it is usually better to add the water to the dyestuff rather than the dyestuff to the water. The use of a little alcohol will accelerate the wetting out of the dry powder and make the pasting much easier. Sulfonated oil can be used in the same way, but a number of the vat dyestuffs are adversely affected by the use of sulfonated oils, particularly colors of the thio-indigoid group, and it is well not to use oil in pasting unless previous experiments have shown that

it has no bad effect on the dyeing properties of the dyestuff. When sulfonated oil has any such bad effect, it usually results in a weaker dyeing, and it will frequently lead to variations in shade from batch to batch.

After the dyestuff has been thoroughly pasted, more water can be added, rather slowly at first, with constant stirring, until the proper volume for reduction is obtained. The dissolved caustic soda is then added and afterward the sodium hydrosulfite is sifted in slowly.

Probably the best vessel for reduction is a Monel-lined tank, but where this is not available ordinary steel drums will do in most cases. However, a steel drum should not be used for the reduction of the chlorine-fast blues, since they are all more or less sensitive to iron, and when they stand for 15 or 20 minutes in an iron drum in the reduced state they are likely to go progressively greener and duller. Dyestuffs of this type should always be reduced in Monel metal or wood. As a general rule, one gallon of water should be used for the reduction of one pound of dyestuff, based on the single strength. While this proportion represents the best conditions of reduction, there are many cases in the production of heavy shades, especially blacks, where it is necessary to reduce the dyestuff in a much more concentrated solution, because the full amount of reduction liquor cannot be contained in the machine.

The optimum conditions of reduction as to time, temperature and concentrations of caustic soda and sodium hydrosulfite, vary with the individual dyestuff, and this information can be obtained for each color from the tables published by the various dyestuff manufacturers. When dealing with single dyestuffs, these recommendations should be very closely followed, as they represent careful work on the part of the dyestuff laboratories to obtain the best conditions for the particular colors with regard to fastness, brilliancy and full utilization of the color value.

As far as possible, of course, in selecting a combination to match a shade, one selects dyestuffs which reduce and dye at the same temperatures, and with the same quantities of caustic soda and sodium hydrosulfite. This is good procedure, as far as it goes, but shades are frequently met with which cannot be matched in this way, and in such cases it is necessary to use dyestuffs of very different dyeing constants. An extreme case of this nature is the necessity of shading Sulfanthrene Pink FF with a yellow or orange, where the pink reduces best near the boil and the other component around 140 degrees F. Where such great discrepancies exist, it is necessary to reduce separately, and pour the two reductions together just before adding them to the dyebath. Where the differences between the reducing temperatures and the amounts of caustic and hydro are not so great, the proper procedure to follow is largely a matter of common sense and experience with the particular combination under consideration. Usually, if the reducing temperature and the amounts of caustic and hydro are chosen for the dominant color in the combination, the results will be satisfactory; if the dyes used are about equally divided, these factors can be averaged.

The amounts of caustic and hydrosulfite necessary for the dyebath are determined not so much by the quantity of color present as by the volume of the bath. The minimum concentration of caustic soda is approximately ¼ ounce per gallon, and of hydrosulfite approximately ⅜ ounce per gallon, while the maximum concentrations will be around 2 ounces and 2½ ounces, respectively, per gallon; the amounts of these two reagents required is thus not directly proportional to the amounts of dyestuff used. Assuming that a range of shades of from ¾ to 1½% is to be produced with the same dyestuff, and that a concentration of ½ ounce per gallon of caustic is sufficient for the weakest shade, it would probably not be necessary to change the caustic concentration for any point in the range up to and including the strongest shade. The concentration of hydrosulfite is usually one-fifth to one-quarter greater than that of the caustic soda.

The spring in usual practice is run at the dyeing temperature of the dyestuffs used. The essential part of the spring is the use of sodium hydrosulfite and caustic soda, the prime object of the springing bath being to eliminate the oxygen contained in the water of the dyebath and trapped in the package of yarn itself, which is not entirely driven out mechanically. As a general rule, about 1% of caustic and 1% of sodium hydrosulfite, based on the weight of the yarn, is sufficient for the spring. In some cases, however, the total amount of caustic and hydrosulfite required for the completion of the dyeing process is sufficiently large to precipitate the dyestuff in the short volume of the reducing bath, if the total amount is added at the time of reduction. Under these conditions, the amount not required for the actual reduction is added to the spring.

The retarding agent is usually added at this time, in order to give the agent a chance to thoroughly permeate the yarn before the addition of the dyestuff. Numbers of retarding agents have been tried, but animal glue, one of the first materials used for this purpose, still appears to be the best. Its efficiency can be considerably increased by the addition of a very small amount of Gardinol, usually less than 0.1 ounce per gallon. Fish glue is perhaps a somewhat better retarding agent than animal glue, but the difference in efficiency is hardly worth the extra cost, not to mention the smell.

As above mentioned, it is of importance to keep all foreign matter out of the system, and the reduced dyestuff should therefore be strained before adding to the dyebath. It is usually added in two portions, one-half on the outside shift and one-half on the inside shift. Where exceedingly heavy shades are being dyed, particularly blacks, it is of

advantage to add the dyestuff in four or more portions, in order to give time for a partial exhaust before more dyestuff is added. Another good method of addition is to reduce the dyestuff in a tank located above the level of the expansion tank on the machine, and allow the solution to run in slowly over a period of ten to fifteen minutes, regardless of shifts. Satisfactory results are obtained by this method, particularly in dyeing very light shades.

Apparently most dyers work out their own systems of shifting package machines. Some are simple schemes, such as two 5-minute shifts at the beginning, followed by 15-minute shifts thereafter; others are decidedly complicated programs. All of these systems seem to give good results. In fact it would appear that any scheme of shifting is satisfactory, provided the machine is in good mechanical condition, the pump is giving proper circulation, and the yarn is properly wound.

There seems to be a difference of opinion as to whether the dyeing should begin on the outside shift or the inside shift. Merely from the balance of probabilities, it would appear that it is perhaps better to start from the outside; however, some dyehouses start habitually from the outside, some habitually from the inside, and some appear to have no preference in the matter. The essential condition is the rapid circulation of the dye liquor; if this condition is met, the method of shifting will largely take care of itself. Unfortunately, the majority of vat colors will exhaust completely without the addition of salt or of any other exhausting agent to the dyebath. I say "unfortunately," because many of the troubles of the vat dyer arise from the rapidity of the exhaust of most of the dyestuffs of the warm—and hot—dyeing classifications. If the speed of exhaust were not so great, much unlevel dyeing would be eliminated. Very light shades, which sometimes have to be produced with rather rapidly exhausting dyestuffs, are particularly difficult to control. If in addition to the use of a larger amount of glue than usual, the amount of caustic soda in the dyebath is increased, this will have a tendency to slow down the rate of exhaust. On light shades, three or four times the normal amount of caustic can frequently be used to advantage for this purpose. The speed of exhaustion can also be controlled by manipulation of the dyeing temperature. In most cases, the proper procedure is to start the dyeing considerably below the optimum dyeing temperature of the dyestuff, gradually raise to the dyeing temperature, and frequently to 10 or 20 degrees above; sometimes it is a good idea to start at a very high temperature, and hold this all the way through the dyeing. The best procedure for any particular shade can only be worked out by carefully considering the behavior of the individual dyestuffs in the combination. Some dyestuffs will exhaust more rapidly at low temperatures, and some more rapidly at high temperatures. In fact, successful vat dyeing is more a product of the study of the temperament of individual dyestuffs than is the case with any other class of colors. It is almost impossible to formulate any rule which will have universal application.

A number of the vat dyestuffs, principally the cold-dyeing types, require the addition of salt to the dyebath in order to produce a good exhaustion. Glauber's salt is the best to use for this purpose, since its action is not so harsh as that of common salt; however, because of the considerable difference in cost in favor of common salt, the latter is extensively used, although greater care must be observed in handling it. A good grade of salt should always be used in connection with vat dyeing, and it should be as free from calcium salts as possible. It is much better to dissolve it before adding to the dyebath, and it should be added quite slowly, and after the first 30 minutes of dyeing. About 10 or 15% on the weight of the goods is usually sufficient, and 20% is as a rule the maximum quantity required. The use of salt in the dyebath with those dyestuffs which require it to produce the full money-value of the color, not only has this advantage, but also simplifies the production of uniform shades from batch to batch; if the dyestuff is not properly exhausted it may go on the fiber more or less at different times.

The draining of the dye liquor from the bath is always followed by a cold wash. The draining and refilling with cold water should be carried out as quickly as possible. As the machine empties, air is drawn in, and if the packages are allowed to remain exposed to the air for any length of time, the outer layer of yarn is likely to become so thoroughly oxidized that it will give rise to the formation of rings. The wash serves to remove a good proportion of the caustic soda and sodium hydrosulfite left in the yarn, thus making it easier to oxidize. It also gives a partial oxidation, and seems to prevent the formation of loose dyestuff on the outside of the yarn. This first wash should always be drained, and when drained it should still show the color of the reduced vat. In other words, sufficient caustic and hydro should be carried over from the dyebath so that the cold wash does not completely oxidize the colors; if the color has been completely oxidized, it usually means that sufficient caustic and hydro have not been used in the dyeing operation, and the result may be smutty and uneven dyeings.

The best possible oxidizing agent for vat colors is ordinary air, and dyeings oxidized by hanging in the air are almost invariably faster than those oxidized by any chemical method. However, air-oxidation is impossible in package dyeing; even if air under pressure is blown through the packages, it is quite likely to precipitate too much loose color, making the dyeing crock, and it is likely also, unless all of the conditions are exactly right, to ring or streak the packages. Sodium perborate is the chemical compound usually used to effect oxidation in the package machine. Not less than 1% on the weight of the yarn should be used, since less than this amount may not bring

about complete oxidation, and 2% represents the approximate maximum without risk of a reduction in the fastness of the dyeing. The sodium bichromate and acetic acid method gives satisfactory oxidation, but since it has a tendency to harshen the yarn and dull the shade, it is seldom employed. The main point to be watched in connection with oxidation is to make sure that it is complete; if any portion of the package remains unoxidized, the unoxidized dyestuff will be washed out in subsequent operations and give rise to light places in the packages.

Experience in operation has shown that it is not usually necessary to throw away the perborate bath. After running for 15-20 minutes at about 130 degrees, the soap can be added and the temperature raised to as near the boil as possible. The time of soaping should never be less than 30 minutes, and should be carried out at as high a temperature as possible, which on most package machines means around 200-205 degrees F. Soaping not only serves to clean up the dyeing and to remove the loose dyestuff, but it also serves a very important purpose in developing the shade and full fastness of the dyestuff. The mechanism of this reaction is not entirely understood, but it is almost certainly more a physical than a chemical change.

Frequently variations in shade from batch to batch can be traced to improper soaping. This part of the operation should never be cut short, and sufficient soap should be used to make sure that the reaction is completely carried out. A safe figure is 2% on the weight of the yarn.

In a dyehouse unfortunate enough to be troubled with hard water, soaping gives rise to a great deal of difficulty; it is absolutely necessary to soap in some way to develop the shade, and even moderately hard water will cause precipitation of lime soaps, which are almost impossible to remove from the package in the machine. This soap precipitation dulls the brilliancy of the dyeings, makes them dust badly in rewinding, and is likely to affect their fastness injuriously. Until recently there was not much that could be done about this situation; within the last few years, however, a number of products have been placed on the market which, while they do not prevent these compounds from forming, when used in conjunction with the soap, act to keep the precipitates so thoroughly dispersed that minimum trouble is caused.

Vat color dyeing is one of the most interesting fields in color application to textiles, simply because it is so largely a matter of individual attention to every shade and to every match. There seem to be no hard and fast rules in vat color application. Each new shade presents an individual problem which very largely must be worked out on its own merits, and each new shade is something of a gamble, the interest in which is heightened by the fact that it must be very nearly right the first time. Because of the extreme difficulty of stripping these dyestuffs to any appreciable extent, there is usually not much that can be done to cover up the mistake of a match that comes up too far off-shade.

The truism that once a dyeing procedure for a shade is adopted, it must be rigidly followed in every dyeing thereafter, is emphatically so when using vat colors. They are probably more sensitive to variations in temperature, time, reduction method, etc., than any other class of dyestuffs, and the production of acceptable results day after day can be accomplished only by close supervision and strict attention to detail.

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Proceedings of the American Association of Textile Chemists and Colorists

Diseases of Steels and Other Metals and their Prevention*

By ROBERT S. WILLIAMS†

I HAVE been playing with metals for a longer time than I like to think about—over 30 years. I think of them more or less like human beings that do all sorts of things we do. You know that one of the common methods of making sulfuric acid is by catalyzing the sulfur dioxide and oxygen to form sulfuric acid by passing the mixture over finely divided platinum. Platinum is poisoned with potassium cyanide. In fact, it is poisoned with almost anything poisonous to human beings.

Then we have the so-called "tin pest". That is a very old story. A great many years ago it was discovered in some of the old cathedrals that the tin organ pipes were going to pieces. This was referred to as a "tin pest", and has come down to us since that time.

Then we have what is known as the crystallization disease,—a form of brittleness.

There are all sorts of things that metals will do that we will also do. For example. we are able to lift a weight of perhaps 150 pounds fairly readily. Take one-half that weight, say 50 or 75 pounds, and we are able to lift that without any particular difficulty, but try putting it down and lifting it several times in rapid succession and you will find that it requires a good deal of effort. We get tired after a few times,—we can call it fatigue. Somewhere in the neighborhood of 75 per cent to 80 per cent of the failure of steel is due to fatigue, when the loads are very much less severe than the steel will stand under normal conditions.

Then we have the growth of metals, particularly cast iron. Metals expand when heated, but cast iron will not only expand, but it will grow something like 30 per cent of its original length. And again we have the increase in strength of the metals with age, much as we do. Duralumin is the outstanding example of this. If we quench in cold water, it increases in strength in two and one-half days from 30,000 pounds to 65,000 to 75,000 pounds.

One of the commonest diseases, and one of the diseases about which we know very little, is the disease of corrosion. I want to talk about that in a general way. Yearly losses due to corrosion, while not large in comparison with our National Debt, nevertheless run into a tremendous amount of money. It is impossible to get anything like an accurate figure, because so many things besides the weight loss enter into it,—failure of machinery, shut down of plant, etc. Many attempts have been made to estimate the loss, and it is believed to be somewhere between two and four billion dollars a year. Therefore, a great effort has been made to reduce the corrosion losses. The unfortunate thing with respect to corrosion is the fact that so many questions are involved. In selecting a piece of steel to do a certain job, it is not difficult to find out whether it will do the job by making a number of simple tests,—tensile strength, elongation, etc., but if you had to evaluate the question of corrosion, there are at least forty facts to be taken into consideration. In order to get any sort of an answer, an enormous number of experiments must be carried out, and we are heading, perhaps not in the immediate future, towards an answer, but the answer will come sometime. We've made a tremendous gain in this direction in the last twenty years.

In speaking of the corrosion of metals, I think it might be worthwhile to call your attention to the different types of corrosion with which we are familiar. First, we have "general corrosion". By that we mean the general thinning of the wall of the corroded material. For example, the condenser tube wall will get thinner until it will no longer stand the load it is supposed to. This type of corrosion is not usually serious, because we have evidence in advance that such corrosion is going on.

A much more serious type of corrosion is what is referred to as "local" or pitting type of corrosion. The actual weight loss to which a metal may be subjected under those conditions is much less serious than with true corrosion, but the material in question may be perforated, and a very small perforation in the condenser tube wall will lead to difficulty in a short time. The question of local corrosion is more serious than the general type.

The third type that might give trouble is the question of embrittlement. That is a combination of stress and corrosion. The most obvious cases of embrittlement are associated with metals that either before service or during service are under stresses, and usually those stresses are

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†Professor of Metallography at Massachusetts Institute of Technology.

not uniform. The embrittlement type of corrosion, known as season cracking, used to be very common. We have discovered how to improve the situation very much, and this type of corrosion is not nearly so common now as it was during the War. It occurred to a great extent during the War in the manufacture of cartridge cases, leading to enormous losses.

In the consideration of corrosion, there are a very large number of things involved. The four main factors I believe are the action of acids of various types, some quite serious, some less serious, but all of them have to be accounted for in the selection of materials. This corrosive action is also true of the salts, particularly those that decompose, such as magnesium chloride, with the formation of hydrochloric acid (muriatic acid) so that we have the acid corrosion effect as with the acid itself. Then we have electrolysis. That usually is a situation that may be overcome without any particular difficulty, if the source can be determined. There are a number of cases on record of corroded pipes, particularly, that seem to have corroded for no reason at all. The pipes were used with good water under perfectly sound conditions. In many cases, contamination may be traced to stray electric current. The fourth, and I believe that so far as iron and steel are concerned, the major cause of corrosion is oxygen. That is the particular feature which causes more trouble in iron and steel than any other one factor. The oxides form too easily, and when oxide formation starts, corrosion also starts, and very serious difficulty commences to arise. I think there is one thing which I can emphasize more than anything else,—if air may be involved at all, it is always worthwhile to see whether the oxygen cannot be eliminated or reduced to a considerable extent.

The question then comes up as to the possible remedies. Here, again, we are faced with the situation that we frequently are not in a position to propose any remedies. If we knew what was causing the corrosion, the academic remedy is not to use the same thing but to get along some other way. Also, by the selection of one metal in place of another. So far as electrolysis is concerned, the cure taken may be insulation. With regard to oxygen, two standard methods have been used, and quite successfully, to remove the air from the water. One is referred to as "de-aeration" and the other "de-activation." De-aeration is a very simple process, and consists in passing the water first into a container, usually with a slight vacuum, at about the boiling point. Under those conditions, a great part of the air may be removed by suction, or something like that, and oxygen-free water will result. De-activation is a similar idea, except that the operation is carried out chemically instead of mechanically. The effect of corrosion by oxygen leads to the formation of rust which may corrode the water lines, and may eat through the pipes. The advantage of de-activation is that it particularly may be made to take place outside of the system. In other words, select something cheap and easily handled, such as old scrap steel, and pass the water through it. The corrosion in that case will take place in the scrap steel, so that the water passing into the system has already done its work, leaving the system comparatively clear. We have, of course, also the question of water purification. There are many types of water purification available, particularly if the corrosive condition is due to certain types of salts commonly occurring in the water used. This may be done by coagulation, by water softening, by the addition of soda ash, by the addition of sodium phosphate, by the Zeolite or so-called Permutit process. All serve to purify the water so that it would be reasonably safe to use. The fundamental question is not so much the question of purification of the water or the removal of the chemicals, but the selection of suitable materials, and when that question comes up we are immediately faced by the fact that we have so many possible materials from which to select, and so many possible corrosive substances, that it is difficult to give an answer that will meet all possible situations.

I have divided the metals into the non-ferrous and the ferrous classes. In considering the selection of any metal to resist corrosion, many things must be taken into account,—whether it will also do the other things required of it, whether it is sufficiently ductile, whether it has great enough strength, etc. We could not make the turbine blades of lead because, obviously, lead is not sufficiently strong. It would not stand the impact of the steam. It is necessary to find a material that will not only resist corrosion but will also resist the impact of impinging water and steam.

In considering the corrosion of non-ferrous metals, some are perfectly familiar to you as acid-resistant in many respects. Lead, for example, is a very satisfactory metal to use in connection with sulfuric acid of practically any concentration. It is very effective, after the start, with hydrochloric acid. Its resistance to sulfuric and hydrochloric acids gives the impression that it is equally resistant to all acids. An example came to my attention not long ago in which a manufacturer concerned with corrosive vapors in the plant decided to use a lead-lined ager built at considerable expense. It was not known by the people who sold him the lead that the corrosive chemical in which he was interested was acetic acid, so the lead lasted something like six months, when it had to be replaced with something else.

Copper is very good as an acid resistant material for many uses. It, however, is soluble, much more soluble than lead, in sulfuric acid. It should not be so, but some sort of reaction seems to take place. That is one of the unfortunate cases in which theory and fact do not agree, but in the presence of sulfurous gases we get quite a re-

sistance to corrosion of copper. If the acid concentration is high, we get a greenish coating which serves as a protection against subsequent corrosion.

So many of our corrosion resistant metals are apparently not as resistant to the action of corrosion as we find them in the laboratory. Aluminum is exceedingly reactive. If aluminum is treated with mercury to clean the surface, and then allowed to stand in the air, a fluffy oxide will form in a very short time. Nevertheless, the formation, which, incidentally is a transparent film of aluminum oxide, is quite resistant to corrosion, so that the corrosion resistance of aluminum is due not to the aluminum, but to the oxide film which covers it. That has been taken advantage of in increasing the corrosion resistance of aluminum.

Aluminite products come in all sorts of colors. The aluminum sets up an oxidizing film which may then be dyed with any number of colors. It is an extraordinary art.

Aluminum oxide film is harder than chromium plate. Of course, one must remember that the hardness of the aluminum oxide film is a question of scratch hardness; it cannot be measured in Brinell degrees. It is not hard in that sense. Any measurement of hardness by any indentation method gives an entirely wrong impression of the hardness of the material. The hardness is associated only with the surface. That has been found to be a very effective method for the protection of aluminum against corrosion. The pure metal is much less readily corroded than any of the alloys, so that if we could use pure aluminum, corrosion would be decreased to a marked extent. In many industries, aluminum is being used which is quite weak in tensile strength. The tensile strength of aluminum in cast form is 8,000 to 9,000 pounds. Rolled aluminum is 10,000 to 12,000 pounds. Advantage has been taken of the corrosion resistance of pure aluminum in the production of an alloy known as Alclad. This is made by placing 99.97 per cent aluminum in thin sheets outside ingots of strong duralumin, and then welding and rolling. It was found possible to produce sheets of this material consisting of the strong, tough center and very thin sheets on one side, or both, of high purity aluminum. The tensile strength is reduced 3 per cent to 4 per cent by the thin sheets of aluminum, but the corrosion resistance is enormously increased. That is a material which is used in the manufacture of wings of all-metal planes. It was also used in making the ZNC-2, the experimental ship made before the Akron was built. It was made entirely of Alclad, but was found to be too heavy for practical purposes.

Another metal that is quite resistant to corrosion, but again has the difficulty of low tensile strength, is tin. We have marked corrosion resistance with respect to certain materials, and very serious corrosion with respect to other materials. Towards most foodstuffs, tin is quite corrosion resistant; hence, its extensive use in the canned goods industry.

Nickel is one of the most corrosion resistant materials we have, and which may be used practically. There again, the use of nickel is a comparatively recent one. When first produced, it was extremely brittle. It had very little use except in nickel plating. The addition of a very small amount of magnesium deoxidizes the nickel and it becomes ductile instead of brittle, and its use, thereby, is tremendously increased.

In the alloys in the non-ferrous group, we have the copper base and the aluminum base alloys. In the copper base alloys, we have, of course, the brasses. These are resistant to a great many types of corrosion, and, of course, they constitute our major corrosion resistant materials in the manufacture of condenser tubes. 99 per cent of all condenser tubes today are made from some variety of brass. There are two types of brass, alpha which is the chief constituent of 70 per cent copper and 30 per cent zinc, and beta which consists of 60 per cent copper and 40 per cent zinc. As the copper content increases, the higher the cost, the more corrosion resistant. The American Brass Company makes a brass containing as high as 85 per cent copper and 15 per cent zinc for use in condenser tubes. The addition of small amounts of tin decreases corrosion. One brass is produced which is composed of 70 per cent copper, 29 per cent zinc and 1 per cent tin. Tin has almost no effect on the physical properties, but has a marked effect on the corrosion resistance. Tin seems to increase the corrosion resistance of practically anything.

We find the bronzes more resistant to corrosion than the brasses. The objection to the use of the bronzes is primarily for economic reasons. They are more costly on account of the high price of tin. Tin is not found in the United States to any extent, so that most of the tin used in this country is imported. The price of tin is quite high. During the War, it cost a dollar a pound; today it costs about 45c to 50c a pound, but even that is very high in comparison with copper at 8½c and zinc at 5½c to 6c.

A very recent development is copper beryllium, which is made by the addition of small amounts of beryllium to copper. Copper has a tensile strength of 35,000 pounds, which, by the addition of 3 per cent beryllium, may be increased to 200,000 pounds. At the same time, it has been found to have marked resistance to corrosion. While little of it is on the market, copper beryllium is, I believe, an alloy that should be followed by anybody interested in corrosion resistance.

In considering the ferrous metals, which are the ones that are of most concern to us, we come to the old question as to which is better. It is an age-long argument which has never been answered. According to evidence that

was taken 30 years ago, wrought iron was preferred over steel. I think we are quite safe in saying today that there is no difference in the corrosion resistance of wrought iron and well made steel. We have many steels today which are equal to, and some superior in corrosion resistance to wrought iron.

In speaking of the ordinary iron or steel, it is not corrosion resistant in the ordinary sense of the word,—it will rust in moist air, is quite readily attacked by all acids, and quite resistant to alkalis, so that for many purposes, the use of steel as a corrosion resistant material is quite out of the question. The earlier method of overcoming or reducing the tendency to corrode was to produce a protective coating. A very old method is galvanizing. Galvanizing is very effective for many purposes, but it must always be remembered, however, that in order to be truly effective, it must be properly done. Attempts have been made, and quite successfully, to apply the zinc in other ways. Electro-plating is one way, but is not quite so satisfactory. Tinning is, of course, very widely used. Tinning, again, must be watched with a good deal of care. When zinc and iron come in contact with a corrosive substance, the zinc will dissolve first, leaving the iron unattacked. The reverse is true in tinning,—the tin is dissolved last, the iron dissolving beneath the tin. The same condition applies to leading. Recently various other methods have been studied. Of course, nickel plating is an old one. Chromium plating is, perhaps, one of the most modern methods. It is very effective against atmospheric corrosion, but is quite soluble in some halogen acids, such as hydrochloric and hydrobromic, and should not be used under conditions in which those acids are likely to be encountered. Quite recently cadmium has been applied, under the trade name of "Udylite". There, again, we have some doubt as to the relative effectiveness of cadmium and zinc. According to laboratory tests, there is no difference, but there again, as unfortunately in so many cases of corrosion studies, laboratory tests do not agree with actual practical experience. Cadmium has not been on the market long enough to get positive information in regard to its corrosion resistance. Cadmium is claimed to be better than zinc. We have not enough practical information to know that that is true, but indications are that cadmium is more effective than zinc. Cadmium is quite expensive. So much, then, for plain steel.

The most outstanding development in recent years in producing a material resistant to corrosion is the iron alloys. One of the earliest attempts to produce corrosion resistance on iron and steel was apparently accidental. One of the large steel companies had accidentally left .15 to .20 per cent of copper in the steel, and that small amount of copper was found to have a very marked resistance against atmospheric corrosion. The copper bearing steels will not resist corrosion as well as some of the others under certain conditions, but for wire fences, steel parts, etc., which are to be exposed to the atmosphere, steel containing about .25 per cent of copper is most effective.

We now come to the question of stainless steel. It is exceedingly difficult to classify the various stainless steels. I can only suggest a certain reasonable division. I think they may be divided into three groups. The first class is the oldest type, the original stainless cutlery type, which is composed of less than 16 per cent chromium and less than .4 per cent of carbon, usually .3 per cent. That, I think, is the first class of stainless steel. These are heat treatable, as are plain carbon steels; they may be tempered and may be quenched for hardening. All the usual operations may be used. Those steels are remarkably resistant to corrosion, and are particularly in use around kitchens, hotels and restaurants for cutlery, etc. The claim has been made that the stainless steels of the cutlery type do not give as good an edge as the carbon steels. I am not quite certain that that is not true. They are not as hard as are our high carbon steels. They cannot be classed, I am sure, with the high carbon steels. The corrosion resistance depends on the surface to a considerable extent. It is very susceptible to slight imperfections, such as file marks, scratches, segregations, etc.

The second group is composed of steels with more than 16 per cent chromium and less than .2 per cent carbon. Stainless steels of this type are not heat treatable,—they cannot be hardened by heat treating operations. They carry fairly high percentages of chromium,—sometimes as high as 18, 20, 25, 30 per cent. These stainless steels are very good for corrosion resistance, and also particularly good as heat resistant metals. Those are the steels known for a long time.

The most recent development in the stainless steel class is the steel that we all know under the trade name of "18-8". It is composed of 18 per cent chromium and 8 per cent nickel. There are a great many compositions now on the market. There is one with 18 per cent nickel and 8 per cent chromium. These stainless steels of the 18-8 type are sold under various trade names,—KA-2, Enduro, Allegheny, Resistal, etc. Those steels are not heat treatable at all. It must be thoroughly realized that they cannot be hardened, cannot be tempered or toughened. The only way they can be hardened is by mechanical working. One or two other things,—this type of stainless steel is exceedingly resistant to almost all types of atmospheric corrosion. It is used on the Empire State Building, as well as on the Chrysler Tower. It is used in all sorts of structures. It is unsurpassed today, except, possibly, by Monel metal, which is a very close competitor. Two things must be remembered with respect to this type of stainless steel. First, the fact that it has a brittleness range at 850 to 1200° F. The earlier types

of this 18-8 were not treated as today. If it was held, even for short periods of time, in the neighborhood of 1000° F., it became brittle. A very interesting illustration of that came to my attention. Stainless steel of the 18-8 type was recommended for the manufacture of a turbined blade for increased corrosion resistance, but it failed at a certain point in the blade. It was thought that the difficulty could be overcome by taking the turbine blades and pouring cast iron around them, thereby imbedding the turbine blades in the cast iron. They went into operation, and in about three weeks the thing broke completely. Failure was found to have taken place in the blade at a point where the temperature had been in the brittleness range, approximately 1000° F. Fortunately, a good deal of work has been done, and is still being done, so I think that difficulty is going to be minimized. The addition of small amounts of titanium serves to cut down the tendency to embrittle. The Union Carbide & Carbon Corp. recently recommended the addition of columbium. We do not know very much about columbium, but if a sufficient demand develops for the use of small percentages of it, it is not impossible to suppose that a source of supply may be found. The other difficulty that has been experienced by many users of 18-8 is the difficulty of machining. It is an exceedingly tough material, and hardens under the influence of the cutting tool. That has been overcome to a very marked extent by the addition of sulfur or selenium in small amounts, i.e., .1 per cent to .2 per cent. Selenium is somewhat expensive, but rather more effective than sulfur in improving the machining properties. Sulfur tends towards brittleness.

DISCUSSION

Q. Under what trade name is copper beryllium alloy known?

A. I don't know, but you can get it from the American Brass Company,—they have a pamphlet on it. Beryllium is very expensive at present—costs $75.00 to $100.00 a pound.

Q. What is the composition of so-called "White Metal"?

A. There are many varieties. It is an alloy with approximately 80 per cent tin, 10 per cent to 12 per cent antimony and the balance copper.

Q. Monel metal vs. Allegheny—How do they compare in acid resistance, alkali resistance and corrosion resistance?

A. First, take ordinary atmospheric corrosion,—I think there is no choice. With respect to alkali, I think there is no choice, both about equally resistant. When it comes to acid resistance, however, that is more difficult to answer, because the two metals behave differently towards different acids. Monel metal is appreciably more resistant to sulfuric acid than is stainless steel. With hydrochloric acid, the reverse is probably true. Neither is really effective, but the choice is in favor of the stainless steel 18-8 as against Monel metal. There is one thing I would like to point out, and that is that metals that behave one way in the laboratory behave entirely differently in actual service, so the only true test is actual service. There are not enough tests on the 18-8 type stainless steel to know which is better, Monel or stainless steel.

Q. Will water which has been de-activated absorb oxygen upon exposure to the atmosphere?

A. Yes.

Q. Assume an apparatus of steel and lead-antimony lead,—what is the resistance of this to concentrated sulfuric acid?

A. The resistance to sulfuric acid would be satisfactory.

Q. What steel is equal to wrought iron from a corrosion standpoint?

A. Any good steel.

Q. What type of steel or alloy-steel is best for acetic and formic acid vapors at 200 to 225° F.?

A. That is quite outside my experience. I would say that no steel would be satisfactory. I would use nickel.

Q. How can we weld stainless steel plates?

A. By any of the welding methods.

Q. Has any practical method been developed for applying a film of aluminum oxide to a copper surface, by electrolysis, to impart a scratch-hard surface to the copper?

A. Not a very successful one. It has been electroplated on copper, but that is not very satisfactory.

Q. How is season cracking in brass prevented?

A. It cannot be prevented altogether, but it can be reduced to a considerable extent by relief annealing at temperatures of 200 to 250° C. The difficulty is that for the purpose of hardening brass, it has been subjected to mechanical working, and mechanical working increases the tendency towards season cracking.

Q. What is Monel metal?

A. It is the product of a naturally occurring ore found in Ontario, and it is normally about 67 per cent nickel, 28 per cent copper and 5 per cent other things, say, iron, cobalt, magnesium and silicon.

Q. Can tantalum be incorporated in an alloy to make it more resistant to corrosion?

A. So far as I know, it never has. Some little work has been done in the manufacture of tantalum steels. Tantalum has very little effect on the corrosion resistance, but does increase the resistance of some of the other properties of steel,—impact resistance and fatigue resistance. However, it has almost no effect on the corrosion resistance.

Q. What metal would you recommend for making pans for annealing brass in a hydrogen furnace at 1400° F.? We are using stainless steel, but they don't stand up very long.

A. I would recommend one of the stainless steels with about 30 per cent chrome and 32 per cent to 33 per cent nickel.

Proceedings of the American Association of Textile Chemists and Colorists

Materials and Methods for

Solubilizing and Desizing Starches*

By CHAS. P. WALKER†

IN TREATING my subject it will be well if I make a confession right now. There is grave doubt in my mind whether starch is ever truly brought to real solution and if it were, its value as size would be very low. It will be necessary, therefore, to determine what we shall consider a "starch solution." The products known as starches consist of grains which appear to consist of an outer shell and a core. The objective aimed at is to break these grains down so that they will produce a homogeneous mass that will penetrate the threads and bind them together. This condition is attained when the grains burst and the core disperses through the water used to make the mix, and it has been definitely established that they are at their greatest value just when this happens, as continued boiling or even mere agitation breaks down the adhesiveness and elasticity of the film when the size becomes dry on the yarn or cloth. For our purpose we will consider this condition as being "starch in solution" though it is really a colloidal dispersion. The object of methods and materials for solubilizing starch is, therefore, to as quickly as possible, burst the shell and get the core dispersed.

Starches are not by any means uniform in character, even grains from the same source vary, some being hard and some soft so far as the shell is concerned and we must bear this fact in mind in deciding what method or material is used to do the work. Obviously, if we break some shells open, the core disperses through the mix and is broken down while the balance is being brought to the state of breaking. The difference in time of bursting with plain boiling water has been found to be as much as two hours with one starch and perhaps even greater with starch from other sources.

The simplest method of dissolving starch, is to boil it with live steam, and here I might say that I find a difference in the result between using live steam and indirect heat. Live steam seems to have a decided, shall we say, catalytic action and without doubt gives the best result. I have just commented on the drawbacks of this method and no further remarks are needed.

Starch after being washed free from proteins, etc., is known as thick boiling starch and as such is in a natural, unchanged form. Methods for making this starch more soluble all aim at breaking down the shell so that the water can get to the core more readily, and consist of treating the starch either at the factory or in the kettle with some agent such as acid or an enzyme. So-called "thin boiling starch" is treated with hydrochloric or sulfuric acid cold under control designed to stop the action before the core is damaged.

Enzymes are employed in the cooking kettle under a temperature limit which attempts also to stop the reaction without attacking the core.

Sometimes acetic acid is used in the kettle, in which case it is hoped that the acid will have evaporated soon enough to avoid damage. The damage to be avoided is the conversion of starch into dextrins, which can easily occur by any of these methods.

Dextrins in themselves have little value as size as they lack elasticity and it takes much more weight to give strength; this extra weight tends to reduce elasticity.

When we consider the great difference in the nature of individual starch grains even from the same source, it is obvious that all these methods expose the core to damage by some grains being exposed to the action of the agent sooner than others.

Roasting of starch hardly comes into consideration except for printing pastes. In this method considerable dextrin is formed, which might be a desirable element in the paste requirement. In comparatively recent years, much interest has been aroused in the action of chlorine on starch. Chlorine in the form of gas is used on both wet and dry uncooked starch to produce the so-called chlorinated starches.

Just what action takes place is not definitely known, but the result is a starch which dissolves in a very short boil (about 5 minutes) and has remarkable strength and

*Paper presented at meeting, Piedmont Section, Feb. 16, 1935.
†Technical representative, The Atkivin Corporation.

elasticity. It also penetrates very readily into the yarn and fabric.

Attempts have been made to produce a similar result by adding soda-chemic to the size in the kettle but with indifferent results. No doubt the alkaline nature of the soda-chemic has introduced a complication, and the uncertain condition of the chlorine content gives differing effects.

The chlorinating of starch proved expensive, as in order to get a uniform product, it was necessary to use a large excess of chlorine to be sure the action was completed; the equipment also was very expensive and the process a long one. Experiments proved that for cotton, jute and sizing other than for rayon, it was not necessary to fully chlorinate the starch; and the search for a chlorine source which was definite in its yield of chlorine in a static condition, i.e., free from the danger of the formation of oxychlorides, arrived at the product Toluolsulfomonochloramide which is known as Aktivin.

This product in the presence of certain organic substances such as starch at the boil in the presence of live steam releases chlorine in definite amount and at a definite rate. To absorb the product of decomposition one atom of sodium was introduced with the result that a size is produced which remains unchanged as to pH. Starch which has been chlorinated remains unchanged in nature, by this I mean there are no dextrins formed.

The time of action with Aktivin appears to be divided into: 10 minutes for the breaking of the grain and 10 to 20 minutes for the completion of the solution of the starch. This appears to be the minimum time attained for proper solution from thick boiling starch to size at its best condition and if consumed quickly at this condition without further boiling or unnecessary agitation it gives maximum strength to the yarn with highest elasticity.

Starch that is not completely burst consists of a mixture of dissolved starch grains and grains that are merely swollen. Simple experiments readily show that starch which is simply swollen and not burst will stick to metals whereas dissolved starch will not. This is why fats are added to sizing. The less the starch is dissolved, the more fat is required to prevent sticking. From every point of view it is apparent that starch should be properly and universally dissolved to get the most value as to strength and elasticity.

The removal of starch from fabrics divides itself into two methods: First by destruction of the starch, and second by the solubilizing of the starch. On goods to be bleached or dyed any method that most completely removes the starch is the one to be used. Either an acid steep (care being taken that the goods do not dry out before being washed) or one of the enzymes which act at temperatures between 140 and 170° F. is satisfactory. Special methods of desizing come into consideration when the above methods might introduce complications.

For instance, certain colors in colored effect goods might be sensitive to acid or to the decomposition products (dextrin, and if the action were extended a long time, glucose) in the case of enzyme desizing. Cases have been known of vat colors being reduced to an alarming extent by these decomposition products. In these cases solubilizing rather than destructive desizing methods should be used.

Here again chlorine comes into the picture. One method used extensively abroad is to run the goods through caustic and chlorine, allow to stand, and wash. The one defect in this method is that caustic fixes albumen and the chlorine combines to form "chloramines" one of the causes of yellowing.

Incidentally, Aktivin, when used as the source of chlorine, appears to dissolve the albumen products and has least effect on colors, actually fixing some of the vats and naphtols against crocking.

On goods containing rayon effects, Aktivin has been shown to have the least effect on the strength and stretch of the rayon and, of course, produces no decomposition products to affect any colors.

DISCUSSION

Mr. Hall: I would like to ask Mr. Walker how he would add acetic acid to a starch which contained oil.

Mr. Walker: This paper was written more around the use of sizing for warp sizing and generally speaking they use unsaponified compounds, in which case acetic acid has no effect on the fats. The general formula is to add 1 lb. 28 per cent acid to each 100 lbs. of starch and bring that to the boil. The acid of course has a similar action as in the method used in preparing thin boiling starch.

As to the action of the acetic acid in the finishing mix, you would have to be guided by the other contents of the mix.

Mr. Sandridge: I would like to ask if there is any advantage in cooking starch under pressure, with the idea of breaking the grain more easily and thoroughly.

You spoke of live steam. I would like to know if there has been any experimental work or whether there would be any advantage in cooking under pressure.

Mr. Walker: Starch for sizing has been cooked under pressure. I have two cases in the South using pressure cooking. There is an advantage, but we find that difference in the grains creates complications. Some starch grains burst before the others and naturally when those are subject to heat, especially temperatures higher than the boiling point, you may get less elasticity and weaker products of decomposition.

One case I know where they cook at 125 lbs. pres-

sure and add acetic. They get starch mix prepared in 25 minutes. I have no data to offer as to difference under pressure and without pressure. Though they use it to save time I am inclined to think 125 lbs. is much too high. There your temperature will be raised and starch will break down into dextrine.

Mr. Dobbin: Why is Aktivin better than chlorine, such as hypochlorites?

Mr. Walker: I would refer you to a report about two years ago on the destructive action of chlorine on cellulose. I believe the finding of the committee making that report was that chlorine in itself does not have any destructive action. It is the by-products. Aktivin does not form oxy-chlorides. Cellulose and starch are closely allied and what applies to one applies to the other.

Mr. Dobbin: It will change its composition?

Mr. Walker: The action of chlorine on starch is not thoroughly known. My own theory is that it does not.

Mr. Thompson: Isn't the difference that chlorine is held in organic combination, while hypochlorite is not?

Mr. Walker: Another theory is that Aktivin releases chlorine more slowly as compared with the inorganic chlorine compound.

Mr. Dobbin: It will convert just as readily.

Mr. Walker: I do not think so.

Mr. Dobbin: I use soda-chemic in connection with tapioca for starches with heavy shades, to get clearer shades.

Mr. Walker: In your work, Mr. Dobbin, you would have a bigger tolerance in the finishing result than the sizing man, and I know that soda-chemic has been used. The alkali thickens the starch and the chlorine reduces it. It may give a "feel" to finish, but for weaving we need the strength and I doubt whether it would give you sufficient strength.

Mr. Del Plaine: What would be the comparative adhesiveness of the thin starch made with Aktivin, and the starch made by putting starch through a ball mill for several hours?

Mr. Walker: In speaking of adhesiveness, we must ask adhesiveness to what? Starch brought to a boil will stick cotton to metal or metal to metal, but when it is fully dissolved it will not. We must get to the point of what type of adhesiveness you have reference to.

Mr. Del Plaine: The idea of your Aktivin is to break down the outside coat. The same thing happens if you put your raw starch in a ball mill and leave it there long enough.

Mr. Walker: I doubt whether there is much difference between starch grain mechanically broken and one broken by Aktivin. Starch grains are not big things and it must call for a colloidal mill set very close to break down the starch grains. They are not uniform in size, so you might break down part and not others, while the enzymes and acids will continue to the core and convert it to dextrine and eventually glucose.

Mr. Del Plaine: Have you tested your starch to see if there is any chlorine?

Mr. Walker: I have tested the so-called chlorinated starch. You may find traces of free chlorine in an inefficiently washed starch, but I do not believe any chlorine has entered the starch molecule.

Mr. Del Plaine: Then there is not any similarity between chlorinated starch and starch prepared with Aktivin?

Mr. Walker: It is difficult to analyze starch which has been cooked. I do not see how we could very well determine whether Aktivin had combined with the starch. The similarity between the result of chlorinating and treating with Aktivin would indicate that the action is the same. I speak of the transparency and strength produced.

Mr. Barker: In finishing piece dyed goods, does starch make any difference in the shades?

Mr. Walker: Starch can have a very significant action on the shade of finished piece goods. If the starch is not fully solubilized, to use a term which is acceptable but which I claim is not true, the starch might dry, and crystallize, and form a film. We find that demonstrated in sizing indigo warp. The shade is less clear. You would conclude it was dyed by a different method. With Aktivin we get a complete breaking down and get a brighter shade.

Proceedings of the American Association of Textile Chemists and Colorists

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the secretary any vacancies which may occur in their businesses.—H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

Note: Persons who have obtained employment should notify the secretary at once. Prospective employers may file vacancies either with the secretary or the American Dyestuff Reporter.

A-3

Education—Ph.B., Brown University, 1920. Two years post-graduate work at M.I.T.

Experience—2 years instructor at M.I.T. 2 years as research chemist in print works (Gum thickenings, application of dyes, dye testing and evaluation. 4 years as chief chemist in bleaching, mercerizing, dyeing and finishing plant. 4½ years as research and plant chemist in silk mills (Colorimetric work in color matching, dye testing and identification and testing of chemicals). 2 years as organic research chemist (laboratory and semi-plant research on organic chemicals, intermediates and dyestuffs). Age 35, married. Will go anywhere, references.

A-6

Education—Analytical Chemistry and Dyeing Course, Lowell Textile Evening School.

Experience—Seven years as print color and dye chemist in printing, dyeing and finishing plants; recently in charge of textile printing department of dyestuff manufacturer.

A-B-2

Education—Lowell Evening Textile School, 1917.

Experience—Five years' experience in hosiery dyeing, full fashioned hosiery of silk and cotton and silk, also men's hosiery containing rayon, wool, cotton and celanese. Several years experience in laboratory work. Has also had experience in jig-dyeing of cotton piece goods, slub and top dyeing.

A-B-4

Education—B.T.C. 1934, Lowell Textile Institute.

Experience—Assistant chemist in cotton knitting plant; second-hand in woolen knit goods dye house. Will go anywhere; references.

A-B-5

Education—Graduate of the University of Lausanne, Switzerland. Doctor's degree in Chemistry. Knowledge of French and German.

Experience—Eleven years with large bleaching, dyeing, printing and finishing plant as assistant Chemist and then Chemist in charge of the Laboratory. Experience in dyeing and printing cotton and rayon fabrics; research and analytical work. Woman.

A-B-C-2

Education—Graduate of Lewis Institute of Engineering of Chicago and graduate of Philadelphia Textile School (Chemistry and Dyeing department).

Experience—Has had extensive experience as assistant chemist and colorist in silk printing, dyeing and finishing; also dyeing raw stock wool; and dyeing and finishing cotton and rayon. Age 30; married; references.

A-B-C-3

Education—3 years at Brown University and Drexel Institute.

Experience—2½ years in dyestuff laboratory; 3 years as second-hand, dyeing indanthrene and direct colors on rayon skeins; 6 months as boss dyer on silk and cotton ribbons and hosiery; 3 years overseer of dyeing and finishing rayon tubing. Can handle laboratory, dyehouse, finishing or outside service. Age 30; married.

A-B-C-4

Education—Graduate, University of Michigan, in Chemical Engineering, 1930.

Experience—One year as assistant chemist and research engineer with metallic packing concern. Three years' experience dyeing and finishing rayon tubing, last two years being foreman dyer. Familiar with other kinds of dyeing. Working knowledge of Spanish. Age 28. Married. References.

A-C-1

Education—4 years at Newark Evening Technical School in Chemical Engineering.

Experience—8 years in manufacturing, research, testing of soaps, oils, gums and finishes and application of same in all phases of the textile industry. Age 23, single. References.

A-E-1

Education—Ph.D., Univ. of Illinois, studied chemical engineering at Columbia, licensed chemical engineer, New Jersey.

Experience—10 years' experience teaching in colleges, subjects included chemical and textile subjects. Has had broad experience in industrial work including experience in testing materials, research and consulting. Will go anywhere; references.

B-1

Education—Educated and trained in chemistry and calico printing in Glasgow, Scotland.

Experience—Has been with large print works as colorist for 13 years producing first class work on cotton, rayon, wool and silk fabrics. References.

B-2

Experience—Boss dyer with one firm for 18 years, divisional supt. at print works for 1 year, in charge of processing and dyeing of cottons and rayons at large bleachery for 6 years. Prefers bleachery in East but will go anywhere. References.

B-3

Experience—Foreman piece dyer for the past 21 years. Can dye the following; celanese, rayon, cotton lacks, wool, silk and mixed fabrics. Has knowledge of finishing and laboratory work.

B-6

Education—Graduate R. I. School of Design.

Experience—5 years in bleachery, 7½ years as assistant dyer, 2 years as boss dyer and 3 years as superintendent of dyeing and finishing. Married, 33 years old. References.

B-7

Experience—Eight years as boss dyer on skeins and ribbons. Over ten years as chemist and head dyer for a large hosiery mill. Experienced on Silk, cotton, rayon and wool in skeins, ribbons, piece goods and all kinds of mixtures. Willing to go anywhere. Not afraid to work or face responsibility. Can handle help efficiently.

B-8

Education—Chemistry and Dyeing Department, Philadelphia Textile School.

Experience—Eleven years experience as chemist and boss dyer on the following: woolen, worsted and cotton yarn; woolen, worsted and union piece dyes on both ladies' and men's wear; wool, cotton, shoddy and mohair raw stock. Age 33, married, will go anywhere. References.

B-9

Experience—Hosiery dyer with fifteen years' experience on high grade silk hosiery; familiar with all types of machines. Age 43, married. Will go anywhere.

B-12

Education—2 years days at N. Y. U. and 3 years nights studying chemical engineering.

Experience—1½ years asst. colorist, 5½ years colorist. Experienced on vats, commercial and fast colors on cotton and cotton-rayon mixtures. References; age 29; married.

B-13

Experience—Large experience as an assistant colorist chemist in silk printing, dyeing and finishing; also on cotton and wool dyeing. References.

B-14

Education—Rhode Island School of Design.

Experience—Familiar with all classes of wool dyeing. Seven years with large carpet mill as dyer and processor of washed oriental rugs. Will go anywhere, married, 37 years old. References.

B-15

Education—B.T.C., Lowell Textile Institute, 1934.

Experience—Experience in dye house running washers, dye kettles and as a dye weighter.

B-16

Education—Chemistry and Dyeing Dept., Philadelphia Textile School.

Experience—Head dyer and chemist on all types of hosiery; dyeing silk, cotton, Bemberg, rayon and unions of same; Celanese and immunized cotton effects. Age 27, married. Will go anywhere.

B-17

Education—Lowell Textile Institute (Chemistry and Dyeing Course) 1916; extension courses at Brown University.

Experience—6 months dyeing wool at finishing company; 2½ years research work on bleaching, dyeing and finishing at dye works; inspector of textile equipment, U. S. Ordnance Dept., during war; 15 years as superintendent of dyeing at finishing company, including all types of colors on cotton piece goods and some rayon and celanese; handled chemical work at last named plant for many years as well as dyeing. Age 40, married, prefers East. References

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ON GETTING ALONG WITH PEOPLE—I

GETTING along with other people is a matter of psychology although most of us manage to worry through life without thinking much about it in that way or, in fact, in any other way.

It happened that I was recently called upon to work with a mill organization to bring about new developments, and in such a way that I might easily appear to be criticizing or "showing up" other people. I appeared to be getting along satisfactorily in the midst of many possible sources of friction, and I began to wonder whether, in the course of a number of years' experience in charge of laboratories and mill departments, I had not perhaps hit upon some sort of useful technique for getting along with other people under such circumstances.

Knowing the troubles that can arise from people having to work with other people where they may appear to be intruding I wondered whether it would not be helpful to those who have not yet done so much of this sort of thing to present some of the rules or suggestions that have emerged from this experience.

A little thought indicated, also, that this is psychology, a subject about which I knew next to nothing. So, like the scientist that a chemist is supposed to be, I decided to check up some of the main points in the literature to see whether I was right before offering them in print.

Here, then, you have some experience on this complicated subject of getting along with people in the mill,—superintendents, foremen, chemists, work people—fortified by confirmation or suggestions mainly from the book, "Strategy in Handling People," a very interesting and valuable popular presentation of this phase of psychology by E. T. Webb and J. B. Morgan.

After jotting down a good many ideas and trying and re-trying to classify them it seemed entirely impossible to divide this broad project up into separate and complete subjects. Hence, like a columnist, we will ramble along from one thing to another without feeling obliged to worry too much about coherence, unity and other attributes of literature that we learned about in school.

These thoughts should be of most use to the younger men in the industry but they are likely to be the ones who will see the least in them at first. The more experienced must have encountered many situations such as will be mentioned and can frequently see how they might have got along better if they could have studied that sort of problem. I think we technical men are prone to think that if we dig out facts and what we think are good ideas they should just naturally be believed and accepted. Actually, of course, it is not as simple as that. The other fellow has his ideas, too. Perhaps they are only notions but they mean as much to him as carefully thought-out ideas, and if they are faulty or incorrect they must be overcome before our ideas will be accepted or acted upon. Sometimes the more faulty they are the harder they are to displace.

While this discussion has unavoidably to deal with generalities and may at first seem rather remote from practical affairs, it is intended to direct attention and thought to the very specific personal problems that arise when laboratory men are running experiments in the mill. The same thoughts apply when office men venture out into the production departments but we are more interested in technical problems involving methods than in such matters as time studies and rate settings.

It is not so much a matter of "do's" and "don't's" as it is a question of degree. To what extent should you agree with another person who is not entirely of your way of thinking; or criticize a mill process to the man who devised it; or compromise on a present issue in order to obtain some greater result? There is no way to cover all possible problems but most of them can be worked out through the development of a correct way of thinking.

Just as science is organized common sense, so getting along with other people in irritating circumstances should be a matter of applied common sense.

You may not now see the value and importance of many of the principles or the little refinements of getting along well with others but it takes only a short time to read about them and only a little longer to find parallels in your own experience, perhaps outside the mill. Since you are bound to take these things more seriously some day it seems only sensible to get into the proper way of thinking as soon as possible.

In entering a mill organization we are likely to find almost any sort of person in any kind of a position and to have not only to get along with, but to *work with* him. Our remarks are therefore intended for those who are willing to think and study a little and who realize that they may still be able to learn more about the part of their work which may be the most important but is usually the most neglected,—human relations.

We hear much talk about human relations and contacts, but aside from a rather general or inspirational article now and then, the matter seems to be left largely to chance. A thinking man cannot escape the conclusion after some

years of experience that his relations to other people in his business should have had careful study as soon as he was called upon to apply his technical knowledge in a practical way.

Since having this subject in mind it has been interesting to note that ideas pertinent to it are frequently encountered in one's general reading and you will undoubtedly find, from time to time, some thought given to such matters as we are to discuss. As such an example one psychology authority states quite plainly that our physical tools, machinery, and means of transportation and communication are, in general, now far ahead of social tools which include tact, methods of approaching and getting along with other people, and of managing other people in business.

(*More comment on this subject will appear in our next issue.*)

● OUTING, S.O.C.M.A.

The annual outing of the Synthetic Organic Chemical Manufacturers Association was held at Skytop Lodge, Skytop, Pa. on June 6th and 7th. The Union Dinner on Thursday evening officially opened the outing and there were about 170 members and guests of the S.O.C.M.A. and the Manufacturing Chemists Association. August Merz, president, presided at the dinner and Lewis W. Douglas, former director of the budget was the principal speaker.

The annual golf tournament was held on Friday and results were as follows: first low—R. C. Quortrup, Barrett Co.; second low—George Uhe, George Uhe Co., and third low—Elon H. Hooker, Hooker Electro-chemical Co. The following players qualified for the kicker's handicap but the draw was won by H. S. Mackelcan: E. G. Robinson, E. I. duPont deNemours & Co.; Milton C. Kutz, R. & H. Chemicals Dept., E. I. duPont deNemours & Co.; H. S. Mackelcan, Innis, Speiden & Co. and Waldo C. Hovey, Niacet Chemicals Corp.

● TEXTILE PRINTING COLORISTS

At a meeting of the National Association of Textile Printing Colorists held at the Narragansett Hotel in Providence, R. I., on Saturday, June 8th, a New York-New Jersey-Pennsylvania division was formed as well as a New England Division. Officers for the coming year were elected as follows: president—William Custer, South Manchester, Conn.; first vice-president—William Dickerson, Paterson, N. J.; second vice-President—Leon Wheeler, Jewett City, Conn.; treasurer—Robert Brown, South Manchester, Conn. and secretary—Frederick L. Babcock, Cambridge, Mass. Richard Reynolds was chosen chairman of the N. Y.-N. J.-Penn. division and William Dickerson, secretary. Organization of the New England Division is not yet complete.

● 1935 FALL SILK CARD

The regular edition of the 1935 *Fall Silk Card,* showing fifty-six colors was recently released to member of the Textile Color Card Association. In addition to the two highlighted features, *"Crushed Pastels"* and *"Arabian Nights,"* the card portrays outstanding basic shades especially arranged in the card with lighter tones to suggest the smartest color harmonies and contrasts. In the basic group are several important shades in keeping with the Italian Renaissance influence in fashion.

● GENERAL RELEASES

General Dyestuff Corp. announces release of the following products. Copies of circulars describing these releases are available upon request.

Benzo Fast Scarlet 4 B S A—a direct dyestuff producing bright bluish scarlet shades on cotton and rayon which are said to be of good fastness to acid. It is further said that this color will stain silk or wool only slightly and will leave acetate white.

Formyl Resist Blue G—a new acid dyestuff producing a very bright shade of royal blue said to be entirely stable to Rongalite and for this reason is recommended by the distributors for discharge printing on silk and wool. It is further said that this color is easily soluble in cold water and is fast to light and washing.

Supramine Bordeaux B A—a new acid color manufactured by General Aniline Works and distributed by General Dyestuff Corp. It is said to level well from a Glauber's salt-sulfuric acid bath and to produce bright bluish reds of very good fastness to light and good fastness to washing, water, perspiration and hot pressing. It is further said to exhaust well from a neutral bath and for this reason is well suited for shading the wool in union dyeing. The dye is also said to have good affinity for silk.

● PHILADELPHIA TEXTILE COMMENCEMENT

Commencement exercises of the Philadelphia Textile School were held in the Philadelphia Museum of Art on Thursday, June 6th. The exercises were merged with those of the School of Industrial Art, both schools being part of the Philadelphia Museum of Art. J. Stogdell Stokes presided at the exercises and E. W. France, director of the textile school presented diplomas and certificates to textile students who had completed the prescribed courses. J. Hampton Moore, mayor of Philadelphia, made the commencement address.

● NEW BEDFORD TEXTILE GRADUATION

Graduation exercises of the New Bedford Textile School took place at the school on Friday, June 7th. Among the speakers were Joseph L. Hurley, lieutenant governor of Rhode Island, Joseph H. Hanford, principal of the school and John T. Kirk, president of the board of trustees. Following the exercises an inspection of the school took place. On Saturday morning the annual alumni reunion was held.

The Importance of the Drug Room in the Operation of an Efficient Dyehouse

By H. G. Price

THE location and layout of the drug room play an important part, not always recognized, in the efficient and economical operation of a plant dyehouse. As regards the placement of the room several factors should be considered. The drug room ought to, of course, be near enough to the dyehouse to be readily accessible. But it should not be so close that the high humidity of the dyehouse will seep in. A condition of this kind encourages inaccurate weighings, since most dyes will absorb a relatively large amount of moisture in a short time. In this connection it should be remembered that a good blower system in the dyehouse is the best aid in keeping excess moisture out of the drug room.

The room should be so located that it has a dry floor always; should be well lighted, adequately ventilated, and properly heated. Too often dyes are stored in dark, musty corner spaces, where their identification is largely a matter of guess, or at the very least a question of much manipulation of barrels. Not infrequently, also, they are stored in cold, damp, unheated outbuildings. In connection with drug room heating, care must be taken not to go to the other extreme. No dyestuff should be placed immediately adjacent to a radiator, as this would result in unduly drying out the dye in one side of the container and would lessen to a great extent the uniformity of the product. One very satisfactory method, if it is available, is to install ceiling radiators.

When considering the layout of the drug room, as differentiated from its location, other factors must be borne in mind. Accessibility of the various dyes, of the balance used in weighing them out, and of a suitable apparatus for dissolving the weighed out matter, are important. A suggested floor plan, the efficiency of which has been proved in actual operation, is shown in Figure I. The size of the room will naturally depend on the space available, and on the amount of dye the mill finds it necessary to carry.

In the room shown the dyestuff barrels (A) are ranged around three sides, and the weighing table (B) is placed against the fourth wall. The barrels rest on racks which keep them off the floor, prevent their sliding from side to side, and tilt them at a slight angle so as to make access to their contents easier. Suitable racks can easily be constructed by the mill's carpenter; for the most part from 2 by 4 lumber.

Each barrel is covered with a tin lid which fits down over the edge of the container, thus keeping all dirt from contact with the dyestuff. Handles on the lids provide a quick and easy means of removing them. When dyestuffs are purchased in metal drums the friction lids with which these containers are supplied by the manufacturers will furnish suitable covers.

Above the barrels the walls are lined with shelving (D). This provides a space for storing smaller quantities of dyestuff—five pound cans and the like.

An essential requirement of a good drug room is plenty of weighing spoons, for use in measuring off dyestuffs from the various barrels. These should be wiped well with cheese cloth or some other similar material each time before they are used, and should be washed frequently. The room should also be supplied with an accurate table platform balance (C), since a poor balance will inevitably give rise to poor results.

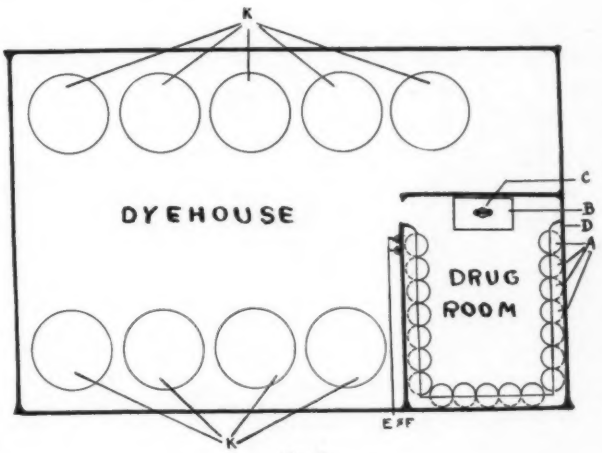

Fig. 1

Immediately outside of the drug room are placed water and steam pipes (E and F), so that dyestuffs can be put into solution as soon as they are weighed, and with a minimum of effort and handling. Dye kettles are represented in the diagram by the letter (K).

When the above suggestions have been put into action we find half the problem solved. We have provided a suitable room, its walls lined with shelves and racks, ready to receive its complement of dyestuffs. The arrangement of colors in the drug room is next for consideration. This question is of more importance than a first glance might indicate. Wherever possible the same dye should always occupy the same space. This will save time which might otherwise be wasted in hunting for the proper color. It will also speed the work of the relief man, since each dye will be in the same place each time he has occasion to work in the drug room, and he will not have to spend valuable time familiarizing himself with a new color layout. This practice of keeping each color in the same place at all times will also prove its worth when, as sometimes happens, a label becomes misplaced. The position of the container in the drug room, if nothing else, will many times identify the color.

Another suggestion which will be found helpful is to keep colors most used easiest of access and near to each other. What these colors are will depend on the particular type of dyeing on which the plant spends most of its time. A mill doing the majority of its work with combinations of the three primary colors will have supplies of these colors close to each other and near to the balance. Another plant, specializing on union dyeing, might have the direct and neutral dyeing acid colors required to produce the same shade on cotton and wool adjacent to each other. A consideration of individual requirements will result in other arrangements suggesting themselves.

A few words regarding the care of the drug room may be appropriate, for no matter how well laid out and arranged it may be, without proper care the room will soon degenerate into a hodge-podge of barrels, drums, and cans. The room should be kept clean and in good order at all times. If the weighing table is covered with ordinary brown wrapping paper this paper can easily be replaced as often as it becomes dirty. The balances themselves should be removed to the dyehouse frequently and there thoroughly cleaned. The floors of the drug room may be cleaned by sprinkling them with sawdust and then sweeping, being careful not to raise an undue amount of dust.

Benefits in accessibility, accuracy, and general efficiency obtained through the use of a properly designed and operated drug room make such a room a valuable and necessary adjunct to every dyehouse.

WASHINGTON NEWS LETTER

(Continued from page 362)

of previous drafts of a Design Copyright Bill. That is to say, administration is vested in the Copyright Office, instead of the Patent Office, and an enrollment fee of $3 is fixed. There is, however, one notable departure, viz, the stipulation that the rights of priority provided for industrial designs in the convention for the Protection of Industrial Property signed at London in 1934 are made applicable to designs registered under the provisions of the proposed domestic Act.

A five year monopoly would be allowed for an original design woven into or applied to the surface of or incorporated into the surface or fiber of a fabric. But the Act would not apply to the illustration or pictorial representation of wearing apparel, patterns or designs. Failure of the registrant or his agent to apply a design to fabrics, lace or embroidery within one year of the date of the certificate of registration shall terminate any exclusive rights in the design unless copied thereafter by one with whom negotiations for manufacture or purchase had begun during the year.

TEMPERATURE AND TURBULENCE

By A. H. Pettinger

THE recently published British discovery that wool may be successfully dyed at temperatures well below the boil and well penetrated into the bargain is sure to arouse the interest of the dyeing fraternity all over the world.* At one time the dyer of wool obtained satisfactory results by controlling such factors as the ratio of liquor to goods, the amount of acid used and so forth but in recent years other more difficult conceptions of the dyeing process have gained favor. Thus instead of quantity of acid put into his vat, it is now known that it is not the amount of acid present but rather the hydrogen-ion concentration that matters. The fact that pH is a scale that reads backwards does not help matters either. Now that the hydrogen-ion conception of acidity has come to be fairly generally accepted in the industry and dyers are getting gradually acclimatized to explaining reactions in these terms, chemists of the Imperial Chemical Industry come along and introduce an entirely new conception, namely, turbulence.

While scientific research is essential to progress and continual investigation is inevitably necessary in the interests of industry, we find it hard to foresee how turbulence is going to be maintained and controlled in the average dyebath. As long as temperature was the important factor in dyeing, the operator was on fairly safe ground and he had but to use a thermometer in order to find out how things stood in the vat. Then again, pH was measurable by relatively simple methods. A small portion of his liquor was taken out and tested with indicators in a tube.

With turbulence, however, we are at once in difficulties, for no method of control or measurement seems possible at the moment. The dyer will, however, be called upon to control the pressure inside his vat which will presumably be totally enclosed. The general effect of this development to the dyeing fraternity, as with the other recent technical advances will be to make him a physicist rather than a chemist.

One wonders where this process will end. Already the time required for educating dyers and chemists is long enough and there is evidence that the college syllabuses are quite thorough enough in the theoretical subjects if a student is to get any practical skill as well as mere book knowledge. All these advances make for further and further specialization even within the industry so that in years to come there will be numerous different kinds of wool dyers including a new class—turbulence wool dyers or what you will. One trembles to think of the specialization which will obtain in say one hundred years if dyeing technology advances as much as it did the last century.

*American Dyestuff Reporter, April 8th, 1935, p. 171.

Technical Notes from Foreign Sources

Delustered Artificial Silk, with Reference to Printing

W. Taussig—Monats. f. Seide u. Kunst-Seide—38,346 (1933)—A continuation, the previous part of which has been noted recently in these columns.

This present section deals with methods of delustering as applied to viscose and cupro-silk. The author gives a brief description of the method of delustering by treatment of the goods (weaves) with successive baths of barium chloride and sodium sulfate, the second bath containing also a wetting-out agent (compare the statements in the previous paper reviewed concerning this method); and states that this method is being more and more preferred by finishers over the aluminium—fatty acid method, as the latter is likely to give trouble from smearing, though the first method also has its own disadvantages. He also gives a procedure for the use of the sodium-tungstate—barium chloride method, and adds, that, whatever the method used, the goods always require an aftertreatment with some softening agent (he recommends Soromin F, with some Monopol Brilliant Oil SO).

For local delustering by printing he gives a few recipes. They may be of enough interest to quote here:

a—The paste is made up of

400 g. tragacanth of 60-1000
200 g. water
20-100 g. acetic acid of 30 per cent
200-300 g. of barium acetate or sodium tungstate

made up to a liter. After printing, the goods are dried, steamed for 5 minutes, and then aftertreated with a bath of 30-50 g. of Glauber salt per liter for the barium acetate, or the same amount of barium chloride per liter for the sodium tungstate.

b—a printing paste containing cryst. zinc acetate, 150 g. per liter, may be used, the local delustering being developed by aftertreatment in a bath containing 40 g. of potassium ferrocyanide per liter.

c—Local delustering may be carried out by printing on a paste containing acetyl-cellulose solution (Serikose LC extra), which may also well contain some suitable pigment. Thus, the Serikose LC, 100 g., is dissolved in 900 g. of a mixture of 4 parts of Serikosol N and 3 parts of alcohol. Of this, 200 g. are mixed with 200 g. of titanium dioxide, blanc fixe, or zinc white, 100 g. of alcohol, and 500 g. of Serikose LC. This, printed on and dried, gives matte designs without any aftertreatment being needed. There is, however, one disadvantage in the method; the printed areas are somewhat stiffer, and possess a harsher feel than the unprinted areas; and this difference cannot be entirely overcome by treatment with softening-agents; so that for thin weaves the first method is to be preferred. The effects thus produced are capable of being overdyed with substantive or developable dyestuffs.

d—Another method involves printing matte designs in colors. Light pastel tones are generally desired, and with the Indigosols, for example, fairly fast effects are obtainable. The example given employs a paste of

400 g. of tragacanth of 60—1000
100 g. of water
300 g. of barium acetate cryst.
5 g. Indigosol dyestuff
10 g. Fibrit D
10 g. Sol Developer D
165 g. water
10 g. sodium nitrite (1-3 solution)

After printing on the above, the goods are steamed for five minutes, and then treated at 60° C. in a bath containing 30 g. of cryst. Glauber salt (for delustering in connection with the barium acetate) and 10 g. of sulfuric acid of 60° B. (for oxidizing the indigosol in connection with the nitrite present in the paste) per liter.

One more method is described at the close of the paper, a method of printing in matte colored designs upon a lustrous weave, grounded with some suitable color. It consists essentially in adding titanium dioxide as delustering agent, egg albumen as fixing agent, and a pigment, as coloring agent, to a suitable printing paste. The example given employs as a paste the following mixture:

30-150 g. of vat dyestuff paste (one of the very finely divided brands, marked as suitable for printing)
30 g. glycerol
30 g. Glyecine A
80 g. water
350 g. pigment thickener
150 g. British gum, 1—1
80 g. potash
60 g. Rongalite C
50 g. Soromine AF paste
20 g. egg albumen 1—1

The pigment thickener referred to is composed of 200 g. of Industriegummi 1e2 and 150 g. of titanium dioxide, the two being thoroughly ground together. After printing, the goods are steamed, well rinsed, or given a weak acid after-chroming to complete oxidation of the dyestuff, and soaped, if the ground-color permits this. The last rinse should contain a softening-agent (the author mentions Soromin F and Monopol Brilliant Oil SO) for best results.

The paper does not claim comprehensiveness, but is merely a contribution, the author remarks, from his own personal experience, of the methods which he knows to work well. He invites other workers to publish contributions in the same spirit. The whole paper is a good, practical one. (We call attention to its disagreement in some points with the previous paper, by Ohl. Such disagreements will ultimately be reconciled by this sort of public conference between real workers.)

Mono-Azo Dyestuffs (for Aftertreatment)

German Patent No. 476,079 (10/V/'29)—*I. G. Farben-Ind. A.-G.*—The definite starting-point of the products here covered is 2-aminobenzene-1-carbonic acid-5-sulfamide (sulfamido-anthranilic acid) or its derivatives or substitution-products, diazotized and coupled with any desired second component. The products may be chromed in substance (heating with chromium formate solution, as usual) or their dyeings after-chromed as usual, or after-coppered with copper sulfate. The dyeings are, in their original form or in the metallized condition, of the most varied color-tones, according to the second component employed for the coupling, and the dyeings are level and of great fastness to fulling, light, washing, and carbonizing.

Five examples are given.

Fast Dyeings upon Vegetable Fibers

German Patent No. 470,537 (22/I/'29)—*I. G. Farben-Ind. A.-G.*—Of limited scope, the process consisting in padding well-cleansed yarn in a bath containing 2-hydroxy-3-naphthoyl-2'-amino-3'-napthol methyl ether and Turkey-red oil, and, after rinsing and certrifuging, developing in a bath of any desired diazotized amine, which has been neutralized by addition of sodium acetate solution. The goods are finally rinsed, soaped, and dried. One example describes the development with a diazo-bath of 4-nitro-1-amino-2-anisole (nitro-anisidine). The color is a clear bluish-red, the red element being of the genuine Turkey-red type. It is added, that the above process may be suitably modified to cover the printing of woven goods.

Azo Dyestuffs (Pigments, etc.)

German Patent No. 470,652 (24/I/'29)—*I. G. Farben-Ind. A.-G.*—Apparently an elaboration of a part of the Naphtol AS group, judging by the second component mentioned, and by the fact that the products may be used as lake pigments. Either diazotized amino-thiazole-monosulfonic acids are coupled to the sulfonic acids of the acetacetic arylides, or the coupling takes place to the unsulfonated arylides, and the coupling product is sulfonated. The products, when generated upon the fiber (possible in the first case) are claimed to be faster to washing than those of German Patent No. 293,333. If applied in the ordinary way, they show a better affinity than usual for cotton.

Two examples are given; one of a greenish-yellow, the other of a pure yellow tone.

Tris-azo Dyestuffs

German Patent No. 476,810 (25/V/'29)—*I. G. Farben-Ind. A.-G.*—In its simplest specification, the present patent describes the preparation of a mono-azo dyestuff from a p-diamine and an amino-naphthol sulfonic acid, this evidently involving the use of the diamine (p-phenylene-diamine is mentioned particularly) in what might be described as its anterior form of p-amino-acetanilide or p-nitro-aniline, either of these being diazotized and coupled to the amino-naphthol sulfonic acid, and the acetamino group hydrolyzed or the nitro-group reduced by sodium sulfide. (Any attempt to diazotize a p-diamine of the benzene or naphthalene series, at least, results merely in the nitrous acid oxidizing the diamine to a p-quinone.) This diamino-azo dyestuff is then tetrazotized and coupled at each end to either two molecules of ahydroxy-ethyl-m-diamine, or to one molecule of such a component and a molecule of any other suitable second component.

Instead of a simple p-diamine, as p-phenylene-diamine (with the qualification above stated), one may use a p-diamine such as benzidine, pdiamino-diphenylamine, etc., 2-amino-8-naphthol-6-sulfonic acid, the naphthalene derivative first considered, may be replaced by any similar component. The hydroxy-ethyl-m-diamines are simply prepared by reaction of ethylene chlorhydrine, epichlorhydrine, etc., upon m-phenylene-diamine or m-toluylene-diamine, etc.

One example is given. The product dyes cotton a deep black.

Azo Dyestuffs (for Viscose)

German Patent No. 475,341 (23/IV/'29)—*I. G. Farben-Ind. A.-G.*—The products described come under the scope of the Naphtol AS series, generally speaking.

The basic components are 4-4'-diamino-diphenylurea and acetacetic arylides. Either the sulfonic acids of the first components are diazotized and coupled to sulfonic acids of the second component, or the sulfonic acids of p-amino-sulpho-phenyl-azo-acetacetic arylides (sulfonated in the arylido component) are converted by carbonyl chloride into ureas, as usual, or, lastly, the diamino-diphenyl ureas are tetrazotized and coupled to the acetacetic arylides, and the products suitably sulfonated.

One of the three examples given describes the tetrazotization of 4-4'-diaminodiphenylures-3-3'-disulfonic acid, and its coupling to two molecules of acetaceto-o-anisidide-sulfonic acid in alkaline reaction. The salted-out product is an orange powder, soluble in water with a pure yellow color, dyeing cotton a clear, rich yellow good fastness to washing, and dyeing rayon a clear golden-yellow, quite fast to light and washing. It is noteworthy that the products, in spite of the presence of several sulfonic groups, are decidedly fast to washing when dyed upon vegetable fibers (of which rayon must be considered one).

● JOINS WARNER CHEMICAL CO.

Kenneth L. Carr, formerly connected with the R & H Chemical Co. in its peroxide service department, has recently joined the peroxide sales and service department of the Warner Chemical Co. in New York City. Mr. Carr, a graduate of Tufts College, was formerly associated with a large New England textile mill and has a thorough knowledge of textile mill problems.

The Warner Chemical Co. is one of the older organizations in the chemical industry and has just recently entered the peroxide field. The experience of Mr. Carr should prove of great value to them.